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Glen E. Books

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of Anath Dodabalapur *et al.*	
Serial No.: 09/480,409	
Filed: January 11, 2000	TC/A.U.: 2828 Examiner: P. Nguyen
For: ARTICLE COMPRISING A TWO-DIMENSIONAL PHOTONIC CRYSTAL COUPLER AND METHOD OF MAKING THE SAME	

BRIEF OF APPELLANT FROM
FINAL REJECTION OF AUGUST 19, 2004

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Applicants Ananth Dodabalapur *et al.* respectfully appeal the Final Rejection mailed August 19, 2004 of their above-identified application.

Real Party in Interest

The real party in interest is Agere Systems Inc., the assignee of applicants' interests in this invention.

Related Appeals and Interferences

There are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of Claims

Applicants appeal the final rejection of claims 1-18. All claims have been finally rejected. The appealed claims are set forth in an attached Appendix.

Status of Amendments

Applicants' Amendment filed October 18, 2004 has not been entered.

Summary of the Invention

This invention is directed to a two-dimensional photonic crystal grating coupler that couples light out of a waveguide plane. The specification teaches that conventional photonic crystal couplers have periodicity in but a single dimension and couple light out of a waveguide plane indiscriminately in all directions (Specification, p. 2, lines 7-19). If the surface of the waveguide is planar, as shown in Fig. 1A of the specification, a one-dimensional photonic crystal spreads light throughout a cylindrical pattern (2 of Fig. 1A). If a waveguide plane has a contoured outer surface as shown Fig. 1B, a one-dimensional photonic crystal coupler may direct the light to a focal point. But beyond the focal point, the light spreads out as a spherical pattern (4 of Fig. 1B). In contrast, a two-dimensional photonic crystal coupler in accordance with the invention (Fig. 2) directs light out of the plane in one or more discrete directions (8 of Fig. 1C).

The structure of the two-dimensional coupler is defined in Claim 1, and all remaining claims depend on Claim 1.

Issues

Two issues were presented in the final rejection: 1) whether claims 2-3 can be rejected as double patenting in view of claims 10-11 of Application No. 09/480409 and 2) whether claims 1-18 are unobvious over three cited references.

Claims 1-6 and 8-18 have been rejected under 35 U.S.C. Section 103 as unpatentable over United States Patent No. 5,233,187 to Sakata in view of U.S. Patent No. 5,910,256 to Tsunetomo. Claim 7 is rejected as unpatentable over Sakata and Tsunetomo further in view of U.S. Patent No. 6,111,902 to Kozlov et al.

The obviousness issue for review is whether the primary reference to Sakata and the secondary reference Tsunetomo can be properly combined under 35 U.S.C. Section 103 to defeat applicants' claimed inventions. Specifically, the Examiner has proposed that Tsunetomo photonic crystals be substituted for the Bragg couplers in the Sakata device. Applicants contend that they cannot be substituted, and there is no reasonable expectation that the proposed combination would succeed.

Grouping of Claims

The claims stand or fall together.

Argument

1. There Is No Double Patenting

Claims 2-3 cannot properly be rejected as double patenting in view of claims 10-11 of Application No. 09/480,409. The case under appeal is Application No. 09/480,409. An application cannot be rejected as double patenting against itself.

2. The Inventions of Claims 1-18 Are Not Obvious

Claim 1 defines this invention as an optical device and, for outputting the light in at least one discrete direction, an "optical coupler [that] comprises a core region disposed between two cladding regions, the core having a two-dimensional photonic crystal grating to output the light in the at least one direction."

There is no teaching or suggestion of such a device in any of the cited references. The primary reference to Sakata is devoid of any discussion of photonic crystal couplers or their problems. The Examiner is correct that Sakata discloses lasers, gratings and photodetectors serially coupled along a common planar waveguide, but the gratings are Bragg gratings, not photonic crystal couplers, and, in particular, not two-dimensional photonic crystal couplers. Moreover the Sakata coupler operates not by directing light out of the waveguide plane but rather by directing light along the plane to a serially connected photodector.

The Examiner recognizes these deficiencies but proposes they are remedied by the secondary reference to Tsunetomo. Specifically it is asserted that Tsunetomo describes a two dimensional photonic crystal that could be substituted for the gratings of Sakata. Applicants respectfully disagree.

To establish a *prima facie* case of obviousness, three requirements must be satisfied: (1) the prior art relied upon must contain some suggestion or motivation for modifying the reference; (2) the proposed modification must have had a reasonable expectation of success; and (3) the reference must teach or suggest all claim limitations. *See In re Chu*, 66 F.3d 292, 36 USPQ2d 1089, 1094 (Fed. Cir. 1995); *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443, 1444-46 (Fed. Cir. 1992); and MPEP § 2143. The initial burden of satisfying these requirements rests squarely with the Examiner. *See Ex Parte Skinner*, 2 USPDQ 2d 1788, 1789 (Bd. Pat. App. & Inter. 1986); MPEP § 2142. The Examiner has not met this burden.

A. *There is No Motivation for Modifying Sakata*

The Federal Circuit has repeatedly emphasized that, in making an obviousness rejection, a modification of the prior art is only appropriate where the modification is suggested in prior art.

> Under section 103, teachings of references can be combined [or modified] only if there is some suggestion or incentive to do so. Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious 'modification' of prior art. *There mere fact that the prior art may be modified as suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.*

In re Fritch, 973 F.2d 1260, 1266, 23 USPQ2d 1780 (Fed. Cir. 1992) (footnote omitted) (emphasis added). *See also In re Gordon*, 733 F. 2d 900, 221 USPQ2d 1125, 1127 (Fed. Cir. 1984) ("the mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification").

In the present case there is no suggestion of the proposed combination. Specifically there is no teaching or suggestion that two-dimensional crystals can be substituted for the Bragg gratings of Sakata to direct light along a plane to a serially connected photodetector. Indeed the invention here directs light <u>out</u> of a plane rather than along it. Accordingly the proposed combination would wither not work or would not produce the claimed invention. *See In re Fritch, supra,* 972 F.2d at 1265 n.12, 23 USPQ2d at 1783 n.12 ("A proposed modification [is] in appropriate for an obviousness inquiry when the modification renders[s] the prior art reference inoperable for its intended purpose").

Nor is there evidence of any reasonable expectation of success in the proposed modification of Sakata. A reasonable expectation of success of the invention also must be found in the prior art, not in applicant's disclosure. *In re Dow Chem.*, 837 F.2d 469, 473, 5 USPQ2d

1529, 1531 (Fed. Cir. 1988) ("Both the suggestion and the expectation of success must be founded in prior art").

As discussed above, the two-dimensional photonic crystal coupler directs light out of the plane of the waveguide (see applicant's Fig. 1C showing the light 8 directed out from the plane). Such a coupler substituted for the Bragg grating of Sakata would produce inoperable structure. Rather than directing light along the plane to the serially connected photodetector, the coupler would direct the light in a discrete direction out of the plane. The proposed modification is neither suggested by the references nor operable. Accordingly, claim 1 and the remaining claims dependent thereon patentably distinguish from the combination of Sakata and Tsunetomo.

Claim 7 is similarly rejected as unpatentable over Sakata and Tsunetomo further in view of Kozlov ('902). However claim 7 depends on claim 1 and distinguishes from Sakata and Tsunetomo for the reasons described above. Kozlov, cited only for disclosure of a specific waveguide core material does not remedy the deficiencies of Sakata and Tsunetomo.

In view of the foregoing, the Final Rejection of claims 1-18 as obvious is incorrect and should be REVERSED.

Respectfully submitted,

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APPENDIX

Claims

1. An article comprising an optical device and, optically coupled to the device, an optical coupler for receiving light input from the device and outputting light in at least one discrete direction wherein:

the optical coupler comprises a core region disposed between two cladding regions, the core region having a two-dimensional photonic crystal grating to output the light in the at least one direction.

2. The article of claim 1 in which the device is selected from the group consisting of a distributed feedback laser and a distributed Bragg reflector laser.

3. The article of claim 2 in which the device is an optical waveguide device and the coupler is integrated on the same waveguide as the device.

4. The article of claim 1 in which one of the two cladding regions comprises air.

5. The article of claim 1 in which one of the two cladding regions comprises SiO_2.

6. The article of claim 1 in which the core region comprises an organic material.

7. The article of claim 6 in which the core region comprises 8-hydroxyquinoline aluminum doped with a laser dye.

8. The article of claim 1 in which the two-dimensional grating comprises a square or a triangular latticed grating.

9. The article of claim 8 wherein the coupler is enclosed within at least two distributed Bragg reflector mirrors.

10. The article of claim 1 in which the device comprises a laser.

11. The article of claim 10 in which the laser is a waveguide laser and the coupler is integrated on the same substrate as the laser.

12. The article of claim 1 in which the coupler is ensconced between two distributed Bragg reflector lasers.

13. The article of claim 1 in which the coupler is ensconced between a plurality of one-dimensional photonic crystal layers.

14. The article of claim 1 in which the device comprises a vertical cavity surface emitting laser.

15. The article of claim 1 in which the coupler directs the output light to a planar waveguide.

16. The article of claim 1 in which the device is selected from lasers fabricated with InP, GaN, InGaN, AlGaN, InGaAs, InGaAsP, GaAs, and AlGaAs.

17. The article of claim 1 in which the device comprises a quantum cascade laser.

18. An optical communications system comprising the article of claim 1.